

West Nile neuroinvasive disease in hospitalized patients

Amy V. Bode

2006 National Conference on West Nile Virus in the United States

February 23-24, 2006

San Francisco, California



SAFER · HEALTHIER · PEOPLE™



Background:

- ❑ Significant morbidity with all West Nile viral (WNV) illnesses
- ❑ Small portion of infected people develop encephalitis
- ❑ Risk factors for WNV encephalitis & prognosis of hospitalized patients still undefined
- ❑ Associated complications of encephalitis undefined but may add significant cost

Goals:

- ❑ Identify risk factors (RFs) for encephalitis among hospitalized persons with WNV illness
- ❑ Describe outcome of index hospitalization
- ❑ Describe clinical complications among persons hospitalized with confirmed WNV illness
- ❑ Determine true cost of illness to discuss potential utility of a WNV vaccine

Previous studies of hospitalized persons:

Romania, 1996, Hahn et al.:

Meningoencephalitis (ME) :

- ❑ Associated with more time outdoors
- ❑ Not significantly associated with hypertension, smoking, diabetes mellitus (DM), age nor gender

New York City, 1999, Nash et al.:

Case fatality ratio (CFR) 12%

Death among persons with ME & muscle weakness associated with:

- ❑ Age ≥ 75 years (adjusted RR: 8.5 [1.2,59.1])
- ❑ DM (age-adjusted RR: 5.1 [1.5,17.3])

Previous studies of hospitalized persons:

Louisiana, 2002, Sejvar et al.:

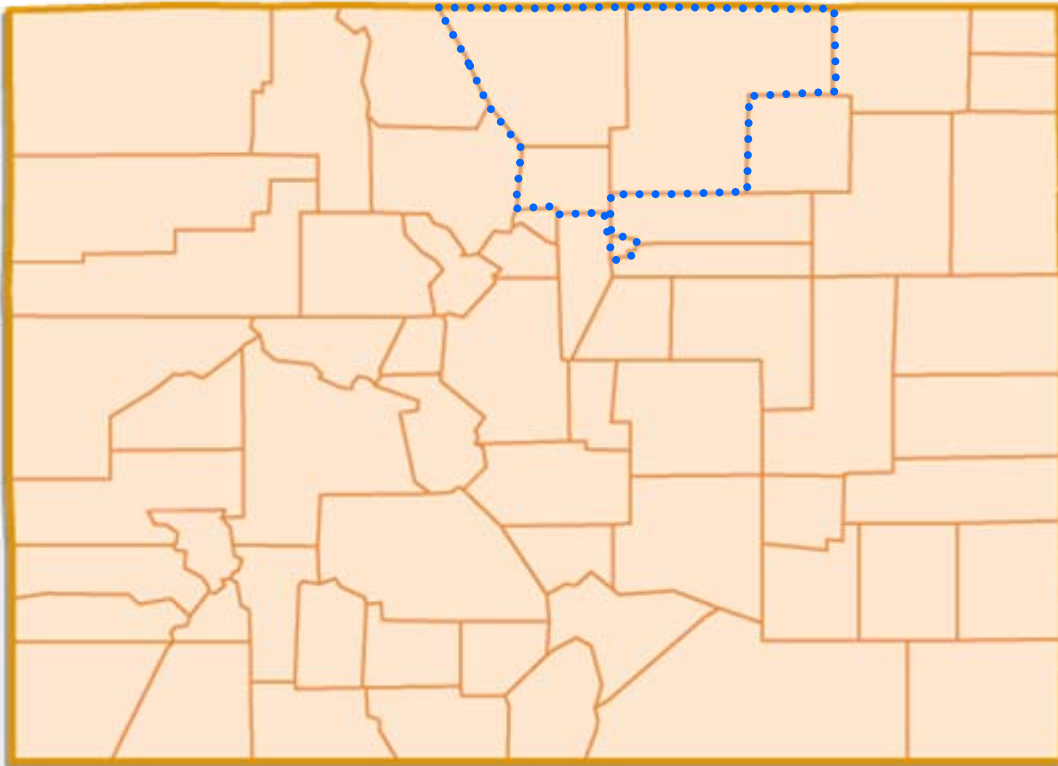
Of 16 hospitalized persons with serologically-confirmed WNV neuro disease (5 meningitis; 8 encephalitis; 3 AFP)

- ❑ 15 (94%) had tremor
- ❑ 5 (31%) had myoclonus
- ❑ 11 (69%) had parkinsonism
- ❑ 1 died

Ontario, 2002, Pepperell et al.:

- ❑ Of 57 WNV patients with encephalitis, 10 (18%) died
- ❑ Of 47 survivors, only 13 (28%) discharged without support

Colorado, 2003: WNV Epicenter



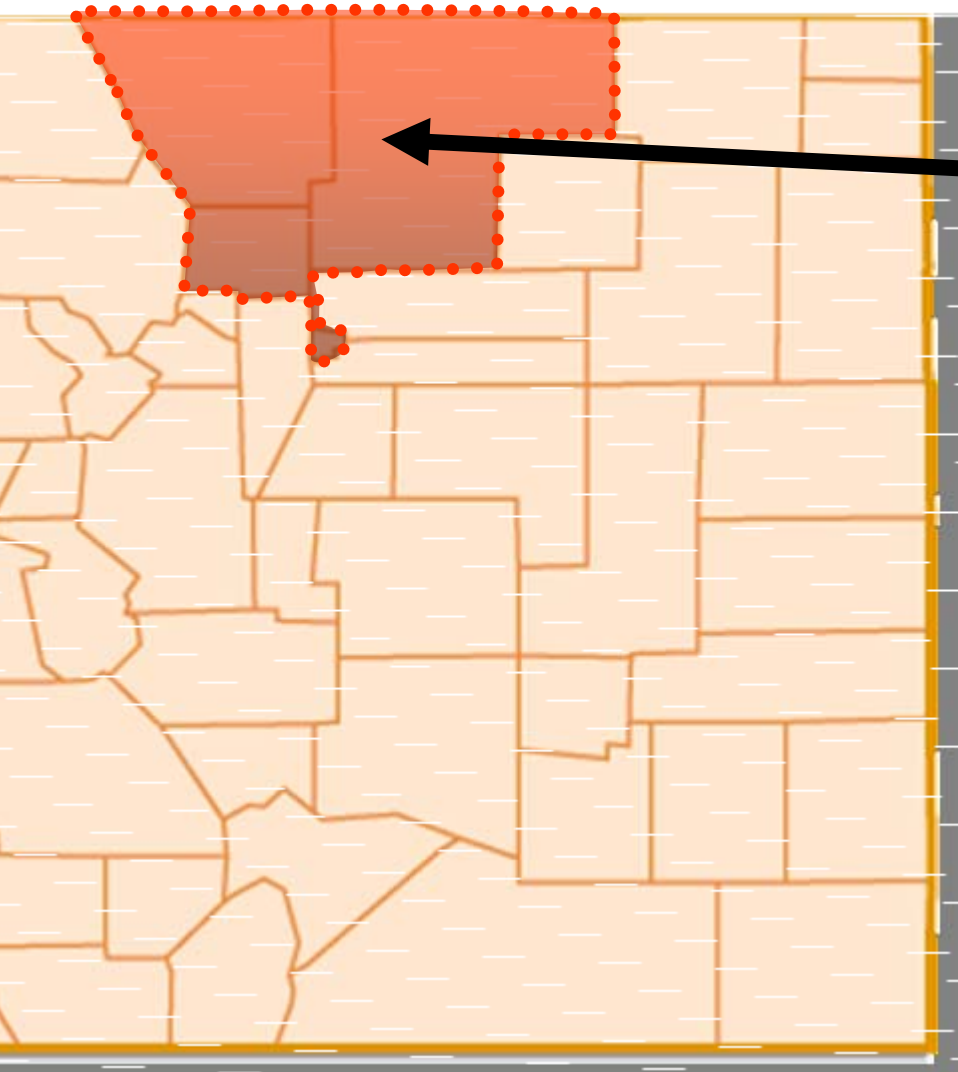
4.6M residents; 64 counties

2,947 WNV illnesses

621 neuroinvasive illnesses

63 fatalities among
neuroinvasive disease
cases (CFR 10%)

Colorado, 2003: WNV Epicenter



Boulder, Denver, Larimer,
& Weld Cos.

1.3M residents (~30% CO's
population)

1,531 WNV illnesses (~52%
CO's reported cases)

333 hospitalized with WNV
illness

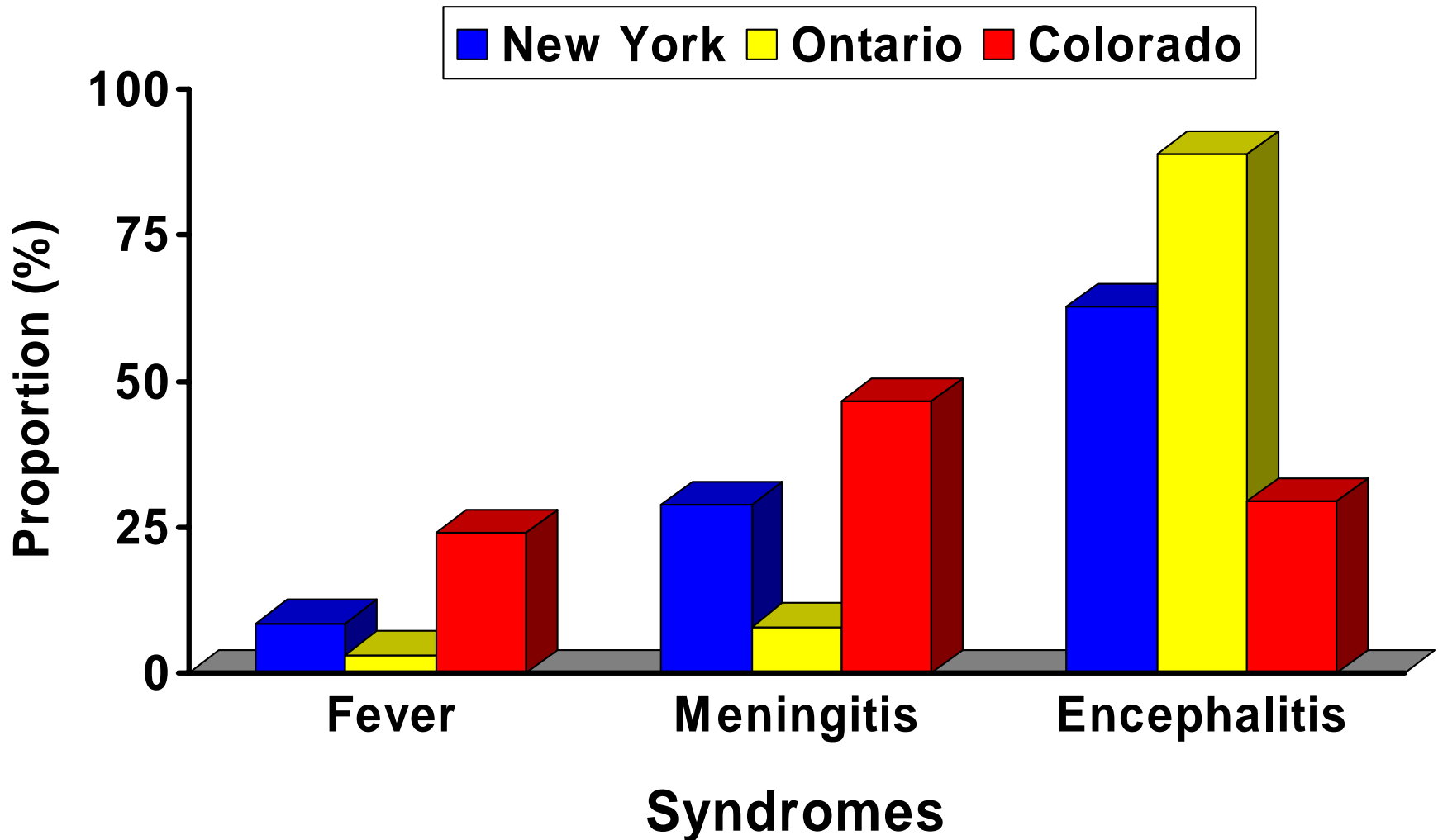
4-County Review, Colorado, 2003

- ❑ Large, population-based study; 333 hospitalized cases
- ❑ 4-County resident, confirmed WNV, hospitalized in 2003
- ❑ Retrospective multi-hospital medical record review
 - ❑ Assigned clinical syndrome
 - ❑ Demographic information
 - ❑ Past medical history & behaviors
 - ❑ Hospital course
 - ❑ Disposition
- ❑ Short-term outcome
- ❑ RFs for encephalitis, limb weakness & death

Results: Colorado, 2003

- 228 (69% of hospitalized persons) medical records reviewed
- 221 patients included
 - 103 with West Nile meningitis (WNM)
 - 65 with West Nile encephalitis (WNE)
 - 53 with West Nile fever (WNF)
- 7 excluded
 - 1 ADEM following SLE viral infection
 - 6 without fever

Proportion of persons with specific West Nile viral syndromes



Impact on hospitalization rates, 4-Counties, Colorado, 2003

- Projecting from 221 cases
- All WNV illnesses: 25 hospitalized / 10^5 population
 - WNE: 7 hospitalized / 10^5
 - WNM: 12 hospitalized / 10^5
 - WNF: 6 hospitalized / 10^5

Results: Colorado, 2003

Risk factors for WNE compared to persons with WNF*

- **Age** – Adjusted OR (AOR): 1.04/year [1.01, 1.07]
- **Alcohol abuse** – AOR: 7.5 [1.5, 37.8]
- **Diabetes mellitus** – AOR: 4.1 [1.2, 13.6]

Risk factors for limb weakness compared to those without weakness*

- **Age** – AOR: 1.02 per year [1.01, 1.04]
- **WNE** - AOR: 3.2 [1.5, 6.5]

*Backward & forward, stepwise logistic regression

Results: Colorado, 2003

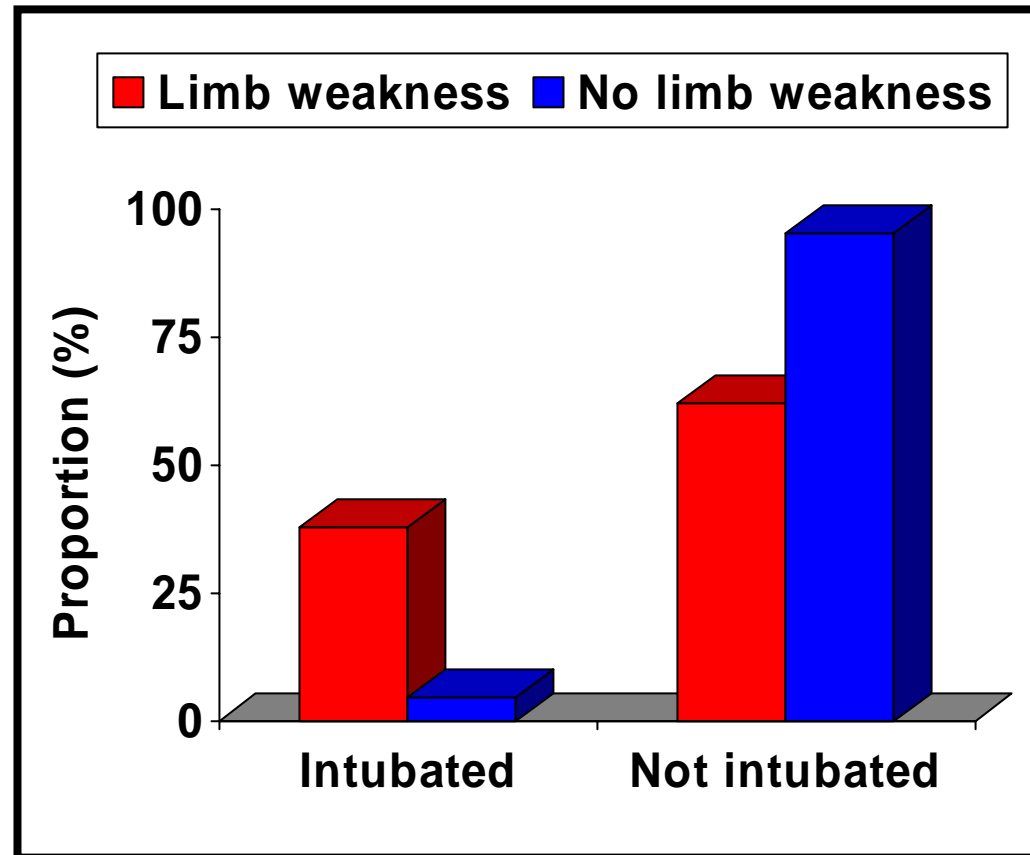
Risk factors for death among persons with encephalitis compared to survivors*

- Age** – AOR: 1.14 per year [1.02,1.29]
- Immunosuppression** – AOR: 26.5 [3.0,234]
- Mechanical ventilation** – AOR: 12.7 [1.2,139]
- History of stroke** – AOR: 42.7 [2.4,756]

*Backward & forward, stepwise logistic regression

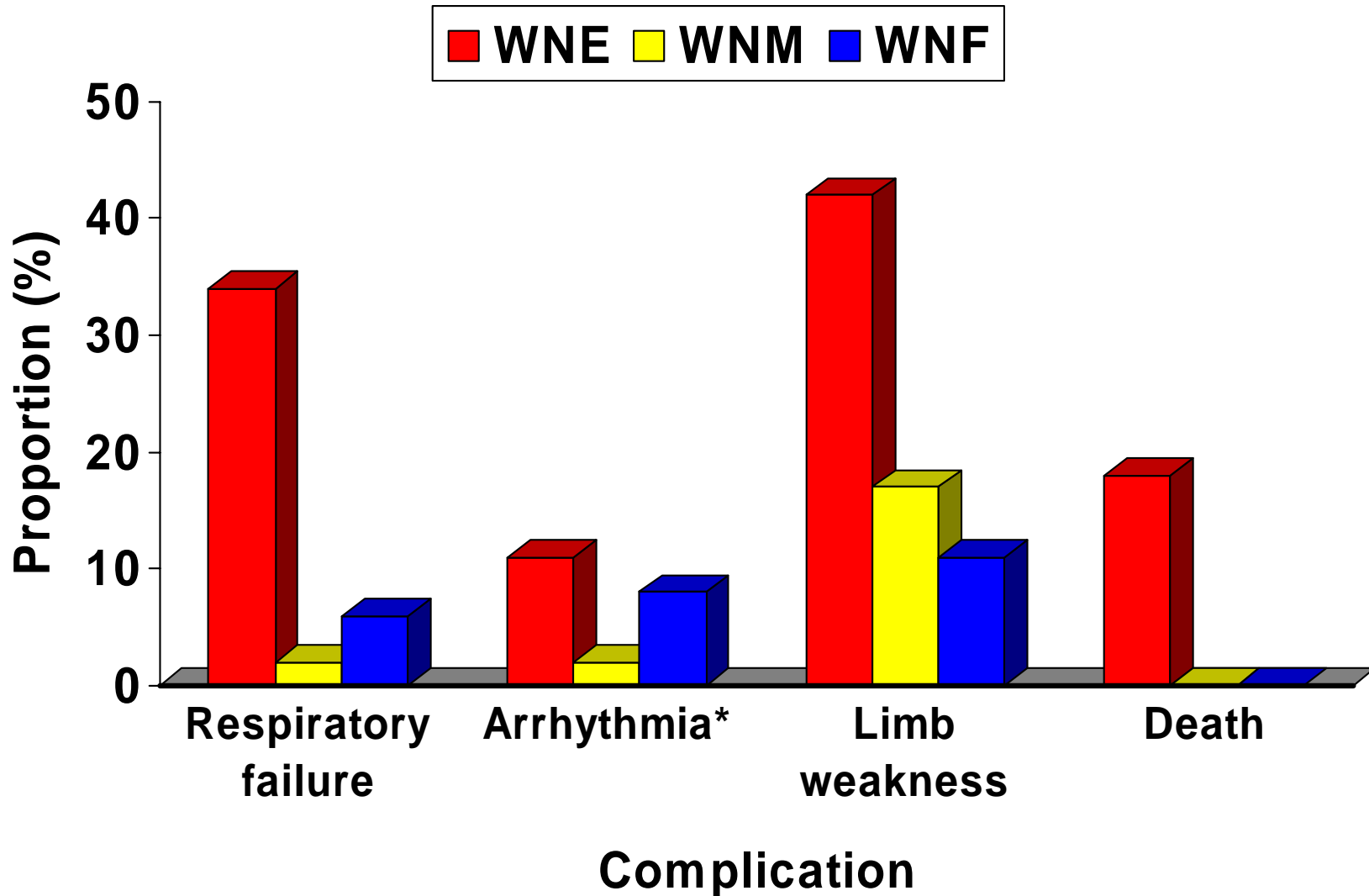
Who will need intubation & ventilation?

- Despite syndrome, patients with limb weakness more likely to be intubated
- *Bulbar dysfunction* (brainstem encephalitis?) associated with respiratory failure
- WNE patients 4 times more likely to have bulbar dysfunction than WNM patients



Take-home: Persons with limb weakness and bulbar dysfunction (dysarthria, dysphagia) at high risk for respiratory failure despite attributed clinical syndrome

Complications by clinical syndrome



* Excludes sinus bradycardia & tachycardia

Disposition following index hospitalization by clinical syndrome

Disposition	WNM	WNE	WNF
Rehabilitation facility	6%	29%	15%
Chronic care facility	3%	17%	2%
Home with assistance	11%	15%	17%
Home without assistance	80%	20%	68%
Died	0%	18%	0%

Conclusions :

- ❑ Age is risk factor for encephalitis, limb weakness & death
- ❑ In addition:
 - ❑ DM & history of alcohol abuse increase risk of WNE
 - ❑ History of stroke, respiratory failure, or immunosuppression increase mortality among those with WNE
 - ❑ WNE increases risk of limb weakness
- ❑ Respiratory failure, limb weakness, & arrhythmias occurred in WNE, WNM, & WNF but more so in WNE
- ❑ Limb weakness & bulbar dysfunction – Watch for respiratory failure



Acknowledgments:

- Roy Campbell
- Jim Sejvar
- John Pape
- Anthony Marfin
- Jen Lehman
- Krista Kniss
- Peggy Collins
- Stephanie Kuhn
- Laura Polakowski
- David Berndt
- Many Infection Control practitioners, Infectious Disease subspecialists, Neurology subspecialists of Weld, Larimer, Boulder and Denver counties, Colorado